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**FINAL ANNUAL REPORT
BASELINE AMBIENT AIR
SAMPLING & ANALYSIS
1 JUNE 1999 – 30 MAY 2000**

**OPERABLE UNIT #1
NEW BEDFORD HARBOR
SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS**

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE <small>(Read instructions on reverse side prior to initiating this form)</small>					DATE 3/30/01		TRANSMITTAL NO: 17.11.02.02 - 001	
SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the Contractor)								
TO: U.S. Army Corps of Engineers - New Bedford Resident Office 130 Sawyer Street New Bedford, MA 02746 Attention: Mr. Maurice Beaudoin			FROM: Foster Wheeler Environmental Corporation New Bedford Harbor Superfund Site Project Office 130 Sawyer Street New Bedford, MA 02746		CONTRACT NO: DACW33-94-D-0002		CHECK ONE: <input checked="" type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____	
SPECIFICATION SECTION NO: (Cover only one section with each transmittal) NA			PROJECT TITLE AND LOCATION: New Bedford Harbor Superfund Site OU#1 and OU#2 Remedial Design and Remedial Action					
ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MFG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. (See instruction No. 8)	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION (See instruction No. 6)	FOR CE USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.			
				a.	b.			
1	Draft Final Baseline Air Report	na	6	na	na	GA	na	
REMARKS FWENC Document #: 2001-017-0084 Distribution: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> M. Beaudoin (1) R. Simeone(5) D. Dickerson (2) J. Brown (1) P. Craffey (1) </div> <div> H. Douglas (1) J. Kraycik (1) A. Ikalainen (1) T. Berceli-Boyle (1) R. Marnicio (1) </div> <div> FWENC Site (1) FWENC Boston file 14.2 R. Hunt (4025 only) G. Willant (4025 only) </div> </div>					I certify that the above submitted items have been reviewed In detail and correct and in strict conformance with the contract drawings and specifications except as otherwise stated. <div style="text-align: right;">Helen Douglas</div>			
					NAME AND SIGNATURE OF CONTRACTOR			
SECTION II - APPROVAL ACTION								
ENCLOSURES RETURNED (List by Item No.)			NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY				DATE	

**USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 0017
TOTAL ENVIRONMENTAL RESTORATION CONTRACT**

DRAFT

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BASELINE AMBIENT AIR SAMPLING & ANALYSIS
1 JUNE 1999 – 30 MAY 2000**

**OPERABLE UNIT #1
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS**

March 2001

Prepared by
The KEVRIC Company, Incorporated and
Foster Wheeler Environmental Corporation for
The United States Army Corps of Engineers
New England District
Concord, Massachusetts

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1.0 INTRODUCTION

Under Task Order No. 17 of the U.S. Army Corps of Engineers (USACE) New England Total Environmental Restoration Contract (NE TERC), Foster Wheeler Environmental Corporation (FWENC) and The KEVRIC Company, Inc. (KEVRIC) have prepared this baseline ambient air sampling and analysis report. This report will document and report results from the one-year baseline ambient air sampling and analysis program at the New Bedford Harbor Superfund Site (Operable Unit #1) in New Bedford, Massachusetts.

This report summarizes collection methods, polychlorinated biphenyl (PCB) data, and meteorological data for samples collected during the period from June 1999 through May 2000. The data is contained in the following appendices to this report:

- Appendix A: Important Terms
- Appendix B: Sample Event Summary Report
- Appendix C: Analyte Data Summary Reports
- Appendix D: Average/Maximum Total PCB Concentrations
- Appendix E: Average/Maximum PCB Congener Concentrations
- Appendix F: Average/Maximum PCB Homologue Concentrations
- Appendix G: Meteorological Data
- Appendix H: Field Data Sheets and Chain of Custody Forms
- Appendix I: 28 June 1999 Summary Reports
- Appendix J: Field Audit Report and Response
- Appendix K: Data Validation Memorandums
- Appendix L: Chemical Quality Assurance Reports
- Appendix M: Calibration Information

Summary data is provided in the narrative that follows. KEVRIC performed field data collection, database design, report programming, and data distribution. Triangle Laboratories, Inc. (TLI) performed the analytical procedures under subcontract to KEVRIC.

1.1. Site Background

The New Bedford Harbor Superfund Site (the site), located in Bristol County, extends from the shallow northern reaches of the Acushnet River estuary south through the commercial port of New Bedford Harbor and adjacent areas of Buzzards Bay. The sediments in the harbor are contaminated with high concentrations of many pollutants, notably PCBs and heavy metals from industrial and urban development surrounding the harbor.

In September 1998, after years of study, public debate, and consensus building, the Environmental Protection Agency (EPA) selected a cleanup remedy for the entire Upper and Lower Harbor area as a solution to the widespread PCB contamination in and around New Bedford Harbor. The remedy involves the dredging of approximately 170 acres and containment of approximately 450,000 cubic yards of PCB contaminated sediment in Confined Disposal Facilities (CDFs) to be constructed along the New Bedford shoreline. The CDFs will be used to isolate the sediments from the public and marine environment. The approximate locations of the four CDFs are shown in Figures 1 and 2, which can be found in the Figures section of this report.

In accordance with the Record of Decision (ROD), ambient air sampling will be conducted during construction/remediation activities to ensure that residential areas near the site are not adversely affected by airborne contaminants. A one-year baseline air sampling and analysis program was also mandated in order to establish baseline conditions prior to the start of construction activities. The first sampling event was conducted in June 1999. Sampling continued on a periodic basis through May 2000. Methods and results of the sampling and analysis program are in the narrative and appendices that follow.

1.2. Monitoring Stations

Seven ambient air monitoring stations, six primary and one duplicate, have been positioned in the area of OU #1, New Bedford Harbor Superfund Site. Sampling locations are located near the future locations of the CDFs. These locations were selected to provide samples that are representative of the impact on surrounding areas. A diagram of sampling locations can be found in Figures 1 and 2 in the Figures section of this report.

Air monitoring and sampling began on 4 June 1999 and continued for a period of one year. A rotational sample cycle (outlined in Section 2.1, Sampling and Analytical Method) was selected to ensure that the baseline program provides representative data without bias due to weather and/or other occasional aberrations. Sampling for the period of June 1999 through August 1999 was conducted at each of the station locations as described in Table 1. Station 26 was not sampled until 22 June 1999 due to property access issues. Sampling for the remainder of the effort was conducted at all of the listed sites.

A total of eight samples were collected for each sampling event: six primaries, one duplicate [or quality assurance (QA)] sample, and a blank. During alternating sampling events, samples from Site 24D, Aerovox Duplicate, were shipped to the government designated QA laboratory. Field blanks (designated as B) were also prepared for shipments to the primary analytical laboratory and the QA laboratory.

Table 1: Sample Locations*

Station No.	Station Name	CDF	Location
21	New Bedford Welding 272 Herman Melville Blvd.	D	Located between Rt. 195 and Rt. 6 in New Bedford
22	Woodlawn Park	Park	Community monitor (west of harbor)
23	Acushnet Substation	Com. Electric	Community monitor (east of harbor)
24	Aerovox	A	Located east of Aerovox building near Upper Harbor
24D	Aerovox Duplicate	A	Duplicate of 24
25	Cliftex	B	Located at the eastern end of Manoment St. next to Cliftex building
26	103 Sawyer Street (Hot Spot CDF)	C	Located at the eastern end of Sawyer St.

* See Figures 1-2.

1.3. Nomenclature

The station locations, identified in Table 1, were numbered sequentially. Site designations began with number 21, which followed previous designations for locations associated with hot spot monitoring and dredging in the New Bedford Harbor Superfund area. Sample identification numbers consist of the

initiation date of the 24-hour sampling event and the station where the sample was collected. For example, the sample number 06049921 identifies that the event was initiated on 4 June 1999 at site number 21, New Bedford Welding.

2.0 QUARTERLY SUMMARY

This section summarizes the sampling and analytical methods, problems encountered during the reporting period, and results. Detailed results are contained in the report appendices.

2.1 Sampling and Analytical Method

The sampling schedule was developed based upon the expected concentrations of the analytes at different times of the year and designed to provide cost effective representative data for the period of the baseline monitoring. PCB concentrations are likely to be highest during the summer months and lower when temperatures drop. Therefore, a rotational cycle sampling schedule was implemented where sampling was more frequent during the summer months (once per week) and less frequent during the spring, autumn (twice per month), and winter months (once per month).

Ambient air samples were collected using EPA Method TO-4A as described in the Sampling and Analysis Plan (SAP) and in the site specific Standard Operating Procedure (SOP) "AQ1-NBH Polychlorinated Biphenyls (PCBs)" developed by FWENC. Samples were collected using PS-1 HI-Vol samplers calibrated to a target flow rate of 225 standard liters per minute (slpm). Sampling media unit consisted of a polyurethane foam (PUF) plug/XAD inserted into a glass sleeve and 4-inch diameter quartz pre-filter. Samplers were calibrated upon installation. Calibration was conducted on a quarterly basis and after each maintenance activity. Flow checks were performed during the sample period and at the conclusion of the sample period. Calibration information was recorded on the PS1 Sampler Calibration Data Sheet. Field data was recorded on the PCB Sample Data Sheets included in Appendix H. Examples of each data sheet are found in "AQ1-NBH Polychlorinated Biphenyls (PCBs)."

Upon conclusion of the sample period, PUF units were removed from the high-volume samplers and samples were packaged on ice for shipment to the analytical laboratory. Field blanks were processed by opening the media on the site and not drawing air through. Chain of custody forms were completed for each sample event, and the original form was sent along with the shipment to the appropriate analytical laboratory. Alternate samples from Site 24D, Aerovox Duplicate, were shipped to the government designated QA laboratory following this procedure. The results and discussion of the independent quality assurance samples are included in Appendix L.

All samples were sent to Triangle Laboratories, Inc., P.O. Box 13485, Research Triangle Park, NC, 27709-3485, for analysis, with the exception of the QA samples. Samples were analyzed using high-resolution gas chromatography with high-resolution mass spectrometry (HRGCMS) operating in selected ion mode (SIM) for total PCB homologue groups. Collected samples were analyzed for total PCB homologue groups as a measure of total PCB concentration. Data are reported for each homologue group (mono through deca) and for total PCBs.

Samples collected during the summer and spring months (June – August 1999, March – April 2000) were also analyzed for the 14 World Health Organization (WHO) congeners. Individual congeners, as shown in Table 2, pose different risks to human receptors and may be useful in the calculation of risk-based action levels for ambient air should this be warranted in the future.

Table 2: List of PCB Congeners

PCB
3,3',4,4'-TetraCB (#77)
3,4,5,4'-TetraCB (#81)
2,3,3',4,4'-PentaCB (#105)
2,3,4,4',5-PentaCB (#114)
2,3',4,4',5-PentaCB (#118)
2',3,4,4',5-PentaCB (#123)
3,3',4,4',5-PentaCB (#126)
2,3,3',4,4',5-HexaCB (#156)
2,3,3',4,4',5'-HexaCB (#157)
2,3',4,4',5,5'-HexaCB (#167)
3,3',4,4',5,5'-HexaCB (#169)
2,2',3,3',4,4',5-HeptaCB (#170)
2,2',3,4,4',5,5'-HeptaCB (#180)
2,3,3',4,4',5,5'-HeptaCB (#189)

2.2. Reporting Conventions

Individual sample results are reported in Appendix B. These include the mass of each analyte as reported by the laboratory, the volume sampled, the resulting sample concentration, and the calculated dioxin toxic equivalency concentration (TEQ). Laboratory and data review qualifiers (discussed in Section 2.4) are described in Appendix A and are included in the tables. Total PCBs are summarized by month in Appendix D and for the year in Table 4. Total PCBs are reported as the sum of the homologue group detected mass values, estimated maximum potential concentrations (EMPC) (where reported), or half of the detection limit values. For example, on 4 June 1999 at Site 25 the following values were reported:

Table 3: Example Total PCB Calculation

Homologue Group	Mass, (ng)*	EMPC, (ng)*	Detection Limit, (ng)*
Total MonoCB	105		0.08
Total DiCB	5640		0.1
Total TriCB	7710	7750	0.06
Total TetraCB	5220	5230	0.1
Total PentaCB	1490		0.3
Total HexaCB	202	212	0.2
Total HeptaCB	35.1	37.6	0.4
Total OctaCB	3.8		0.5
Total NonaCB	ND		0.6
Total DecaCB	ND		0.7
Homologue Group Sum (bolded values) = 20469 ng			

* ng : nanograms

In order to calculate analyte concentrations, including subsequent average and maximum concentrations, several data validation conventions are applied. The concentration values for non-detects are calculated at half the detection limit, based on the assumption that the actual concentration is likely to be somewhere between zero and the detection limit. The exception to this data validation convention is congeners #189 and #209, which if detected, were detected intermittently and at relatively low concentrations such that their actual presence is questionable. Including non-detects with elevated detection limits at half the detection limit results in relatively high values; in turn, skewing the resulting averages higher. Consequently, when calculating concentrations for congeners #189 and #209, non-detect values were

disregarded (i.e., not included as a result). For analytes qualified as U, due to blank contamination, the analyte concentrations are calculated at half the reported value. In all cases where an EMPC value was reported, this value is used in calculating analyte concentrations in lieu of the reported value.

2.3. Problems and Corrective Action

2.3.1. *Field Audits*

2.3.1.1. Performance Audit

FWENC conducted a field performance audit on 7 July 1999 and identified five action items related to the samplers. Each action item was resolved and written confirmation was provided on 12 August 1999. Action items were of a minor maintenance and housekeeping nature. The items included: sampler cleaning (sampler 21); replacement of sampler exhaust hoses (sampler 21 and 25); attaching sampler platform tie downs (samplers 24, 24D, and 26); and bolting of sampler to the platform (sampler 26). The audit flow values versus the sampler flows, contained in Appendix J, were within $\pm 7\%$, indicating that no action was required to determine the difference between flow rates. Overall, the audit results were rated as acceptable.

FWENC conducted a second field performance audit on 27 October 1999 and identified two action items related to the samplers. Each action item was resolved and written confirmation was provided on 3 December 1999. Items were of a minor maintenance nature and included the reattachment of a sampler cover (sampler 26) and recalibration of sampler 24D, which had an audit flow versus the sampler flow difference of 7.5%. The audit flow values versus the sampler flows, contained in Appendix J, for the remaining six samplers were within $\pm 7\%$, indicating that no action was required to determine the difference between flow rates. Overall, the audit results were rated as acceptable.

FWENC conducted a third field performance audit on 1 March 2000 and identified two action items related to the samplers. Each action item was resolved and written confirmation was provided on 20 March 2000. Items were of a calibration and safety nature and included calibration of all of the samplers for the baseline study (samplers 21, 22, 23, 24, 24D, 25, 26) and a sampler electrical hazard (sampler 22). The audit flow values versus the sampler flows, contained in Appendix J, were within $\pm 7\%$, indicating that no action was required to determine the difference between flow rates. Overall, the audit results were rated as acceptable.

FWENC conducted a fourth field performance audit on 24 May 2000. The audit flow values versus the sampler flows, contained in Appendix J, were within $\pm 7\%$, indicating that no action was required to determine the difference between flow rates. Overall, the audit results were rated as acceptable, and no conditions required action; therefore, no response to this audit was necessary.

2.3.1.2. Task System Audit

FWENC conducted a task system audit on 17 March 2000 and identified one major and five minor findings. Each finding was resolved and written confirmation was provided on 17 April 2000. The major finding was in reference to a lack of current calibration documentation on samplers. The minor findings included: the lack of an organization chart; spare parts inventory; initials and dates for corrections; completion of blank cells on forms; and a data consistency check. Overall, the audit results were rated as acceptable. The complete audit findings and response are included in Appendix J.

2.3.2. *Sample Temperatures*

The analytical laboratory (TLI) recorded the temperature for each cooler upon arrival and reported that various samples arrived at the laboratory warm. The laboratory immediately refrigerated the samples to 4°C. Case narratives from the laboratory indicated that sample temperatures fluctuated between 4°C to 28°C. In some cases, the laboratory documented elevated temperatures despite the presence of (still)

frozen ice in the cooler. Samples were originally packed with "blue-ice" blocks until this method proved inadequate. Sampling personnel were informed of the recurring problem. Procedures were modified to ship all samples on "real" ice and to use as much ice in the cooler as possible. No validation action was taken for the temperature exceedances (refer to Section 2.5.1).

2.3.3. *Incorrect Units for Results*

One set of preliminary sample data was reported by the analytical laboratory (TLI) in concentration units of picograms. These units were incorrect and should have been nanograms. The samples in question were collected 16 June 1999, TLI Project Number 48944. The results have been corrected, and a note has been appended to the original sample result file confirming the laboratory reporting error and correction.

2.3.4. *28 June Anomaly*

Results from the government QA laboratory for sample 24D collected 28 June 1999 differed significantly (higher) from those reported by the primary laboratory for the associated sample (24). Upon further review and with comparison to the remainder of the data set (June, July, and August), it was noted that the primary lab's results were significantly lower than typically reported for this location. In addition, none of the reported results (from any station) for this day appeared consistent with other dates. This strongly suggests that samples from this date were inadvertently switched and/or mislabeled, either in the field or in the laboratory. No other problems with the sampling or analysis were identified to resolve the discrepancies. Accordingly, it is recommended that data from this date be rejected as unusable for project objectives and that these data be omitted from further consideration in establishing baseline conditions. The data for this day was excluded from the report summaries in Table 5 and included in Appendix I.

2.3.5. *Lost Samples*

Two samples collected on 27 August 1999, samples 08279922 (Woodlawn, Site ID 22) and 08279924 (Aerovox, Site ID 24), were lost during the extraction process at the laboratory and cannot be reported.

2.3.6. *Cancelled Samples*

The sample collected from Woodlawn Park, Site 22, on 17 February 2000 was sent to the analytical laboratory for analysis. The analysis for the sample was cancelled due to insufficient monitoring duration in the field.

2.3.7. *Inconsistencies in Factory Calibration of Orifice Flow Standard*

The Baseline Air Sampling and Analysis program required the calibration of all air stations using an orifice as a flow standard and a second orifice for periodic audits, as described in the project SAP and in the air sampling SOP. Prior to initiation of this baseline program, the factory supplier (Anderson Instruments, Incorporated) determined the orifice calibration constants for both orifices. The orifices are required to be recalibrated by the supplier annually. Using the orifice standard, the air stations were calibrated each quarter and were also calibrated after any maintenance activity.

Following the first year of sampling, both orifice(s) (flow standards) were sent to Anderson Instruments, Inc. (Anderson) for calibration in June 2000. The calibration results, received on 28 June 2000, were noticeably different from the previous calibration performed a year prior. The orifice(s) were sent to a third independent laboratory, IML Air Science (IML), for calibration verification. The IML calibration (received 7 August 2000) confirmed the results from Anderson's June 2000 calibration. Orifice calibration settings should not vary significantly from year to year; therefore, it appears likely that there was some error in the original factory calibration settings applied to samples collected during the baseline sampling period (June 1999 through May 2000).

To quantify the significance of the potential error in flow rate measurements, theoretical estimates of the different flow rates from the two calibrations were calculated by applying the calibration constants from the June 2000 calibration and comparing the results to the settings recorded during the actual sampling event (from the initial calibration). A calibration curve was generated in the field by setting the sampler magnehelic to several calibration points and recording the response of the orifice manometer. From this curve, a slope and intercept was obtained to calculate the flow rate.

Based on these calculations, a flow rate of 225 slpm from the initial calibration (June 1999) would be calculated as approximately 20% lower (180 slpm) using the June 2000 calibration. Accordingly, if the June 2000 calibration were a more accurate indication of flow rates, the actual concentration of total PCBs would be approximately 20% greater than reported in this baseline report. For example, the total PCB results reported for stations 22 and 24 on 16 June 1999 were 1.5 ng/m³ and 110 ng/m³, respectively. Using the more recent calibration to determine flow rate, the total PCB concentrations would be 1.8 ng/m³ and 130 ng/m³. The supporting documentation, including the June 1999 and June 2000 calibration data from Anderson and the third party verification from IML, are included in Appendix M.

2.4. Summary Data

Table 4 provides a summary of the total PCB concentration data by sampling site and sampling event date. The meteorological data for each sampling event date included in the table are based on the earliest start and latest end times for all the sampling stations. The meteorological station takes readings every 5 minutes and averages these 5-minute readings at the end of every hour, as contained in Appendix G. For example, the sample at site 21 on 4 June 1999 started at 08:44 a.m. (earliest start time) and the sample at site 22 ended at 11:12 a.m. on 5 June 1999 (latest end time). Therefore, the average temperature, average solar radiation, and total precipitation are calculated based on the 4 June 1999 09:00 a.m. data through 5 June 1999 12:00 p.m. data. The total PCB concentration is the sum of the total PCB homologue groups found in the detailed sampling event data reports in Appendix B. Blank data fields in the tables were the result of one of the following: (1) Samples for Site 26, 103 Sawyer Street, were not initially collected due to property access issues; (2) Samples collected on 27 August 1999 for Woodland Park, Site 22, and Aerovox, Site 24, were lost at the laboratory; (3) Spike sample results are not included in this table; and (4) Sample for Woodlawn Park, Site 22, on 17 February 2000 was cancelled due to insufficient monitoring duration.

Table 4: Total PCB Concentrations (Homologue Basis) and Meteorological Data

Daily Meteorological Data					Total PCB Concentrations (ng/m ³)						
Sample Event Date	Prevailing Wind Direction	Avg. Temp. (°F at 2m)	Avg. Solar Radiation (w•m ²)	Total Precipitation (inches H ₂ O)	21 New Bedford Welding	22 Woodlawn Park	23 Acushnet Substation	24 Aerovox	24D Aerovox Duplicate	25 Cliftex	26 103 Sawyer St.
04-Jun-99	NNE	69	370	0.00	16	1.9	27	230	220*	70	‡
10-Jun-99	ENE	65	470	0.00	19	2.4	21	96	100	67	‡
16-Jun-99	ENE	65	270	0.010	18	1.5	17	110	200*	55	‡
22-Jun-99	SSW	76	380	0.00	8.5	3.1	15	150	170	63	28
28-Jun-99	SW	76	280	0.00	PCB data rejected as unusable (see text)						
06-Jul-99	WNW	86	370	0.00	9.8	4.3	40	160	170	24	49
10-Jul-99	NW	73	240	0.00	1.2	0.69	41	74	160*	5.4	18
16-Jul-99	WSW	84	320	0.00	3.8	1.1	42	110	S	13	33
22-Jul-99	SW	77	280	0.00	3.7	1.3	41	120	180*	16	7.9
28-Jul-99	WNW	83	360	0.00	19	2.5	41	140	160	66	69
03-Aug-99	S	76	290	0.00	8.1	4	21	130	300*	54	31
09-Aug-99	NNW	69	330	0.00	11	2.6	54	120	110	58	45
15-Aug-99	NNE	67	96	0.20	20	0.45	27	110	270*	36	30
21-Aug-99	N	65	60	0.00	12	0.84	40	88	97	48	35
27-Aug-99	SSE	76	160	0.00	18	†	23	†	290*	53	33
09-Sep-99	SSW	76	99	0.00	8.1	8.9	24	110	110	53	27
22-Sep-99	NW	59	88	0.010	2.6	0.76	39	54	80*	13	22
08-Oct-99	SSW	63	150	0.00	2.4	1.1	28	74	S	17	7.8
25-Oct-99	NW	50	180	0.010	19	4.2	25	62	100*	42	65
15-Nov-99	WNW	40	99	0.00	1.4	0.84	14	52	46	3	70
16-Dec-99	WSW	45	57	0.00	4.1	4.3	7.4	44	78*	2.3	96
14-Jan-00	NW	12	110	0.00	0.094	0.077	8.8	29	15	0.51	87
17-Feb-00	NNW	29	160	0.00	6.2	C	13	22	23*	6.9	84
15-Mar-00	SSW	52	220	0.00	0.87	0.57	58	68	70	34	28
04-Apr-00	WNW	52	91	0.28	1.4	0.35	22	73	100*	17	160
17-Apr-00	ENE	44	130	0.11	9	1.1	1.1	57	22S	27	23

Daily Meteorological Data					Total PCB Concentrations (ng/m ³)						
Sample Event Date	Prevailing Wind Direction	Avg. Temp. (°F at 2m)	Avg. Solar Radiation (w•m ²)	Total Precipitation (inches H ₂ O)	21 New Bedford Welding	22 Woodlawn Park	23 Acushnet Substation	24 Aerovox	24D Aerovox Duplicate	25 Cliftex	26 103 Sawyer St.
08-May-00	SSE	73	300	0.00	12	9.5	25	100	240*	53	99
30-May-00	SE	57	280	0.00	16	9.1	8	87	92	43	31
Total PCBs Site Average					9.4	2.7	27	95	140	35	49
Total PCBs Site Maximum					20	9.5	58	230	300	70	160

* Alternate duplicate samples analyzed by the U.S. Army Corps of Engineers designated laboratory. See Appendix L.

† Samples were lost at the laboratory.

‡ Samples were not initially collected at this site.

S Spike sample.

22S Spike sample collected at site 22.

C Analysis cancel due to insufficient monitoring duration.

The data tables and supporting documentation are found in Appendices A-M and include the information listed in Table 5. The reports provide data collected during each of the sample events (through the end of the reporting period). All field and analytical data are contained in a Microsoft Office Access® database. The database, available for electronic transfer, contains all data, queries, reports, forms, and modules. Written laboratory reports are maintained on file and are available as needed.

Table 5: Description of Summary Reports

Appendix	Report Title	Description/Contents
A	Important Terms	Column heading descriptions and data qualifier definitions.
B	Sample Event Summary Report	Detailed reports for each sample analyzed. Includes the PCB homologues and congeners results, quality flags, detection limits, TEFs, TEQs, EMPCs, meteorological data, and sampling information (flow rate, run time, sample volume).
C	Analyte Data Summary Reports	Concentration results of each PCB congener, by site and sample date.
D	Average/Maximum Total PCB Concentrations	Average and maximum total PCB concentration, by sample site, for each month in each quarter and for the year, as well as a cumulative average and highest value recorded to-date.
E	Average/Maximum PCB Congener Concentrations	Average and maximum congener PCB concentration, by sample site, for each month in each quarter and for the year.
F	Average/Maximum PCB Homologue Concentrations	Average and maximum homologue PCB concentration, by sample site, for each month in each quarter and for the year.
G	Meteorological Data	Hourly summary, by event date, of wind direction and speed, temperature, solar radiation, barometric pressure, relative humidity, and precipitation. It also contains the windrose graphic for that event day.
H	Field Data Sheets and Chain of Custody Forms	Field sample data report sheets and the chain of custody forms, by sampling event date.
I	28 June 1999 Summary Reports	Analyte data report and preliminary sample event summary report for this event date. Results determined to be unusable for project objectives.
J	Field Audit Report and Response	Field audit reports conducted by FWENC and responses from KEVRIC.
K	Data Validation Memorandums	Data review reports prepared by FWENC for data validation purposes.
L	Chemical Quality Assurance Reports	Chemical quality assurance reports prepared by ENSR Corporation.
M	Calibration Information	Information to support the flow rate calculations based on the potential error in factory calibration of orifice flow standard.

2.5. Data Validation and Quality Control Data Review

Air sampling chemistry data have been reviewed for compliance with quality control (QC) criteria to determine their acceptability for use in achieving project objectives. The primary objective for the collection of this air data is to compile one complete year of data as a baseline for comparison with future air sampling results during upcoming construction activities. The data review process and the findings are described in more detail below. The individual data QC memorandums (prepared for each data package) are included in Appendix K. In addition, the USACE assesses data quality with the independent QA analysis of duplicate samples. These results are compared with primary lab results and reported in Chemical Quality Assurance Reports (CQARs), which are included in Appendix L and briefly summarized below.

Air sampling results were given a "checklist" QC review by FWENC for compliance with Project QC criteria. This review was based on the "Region I, EPA NE Data Validation Functional Guidelines for Evaluating Environmental Analyses," December 1996 criteria, and was intended to identify significant QC exceedences which may significantly affect the reported sample results. This brief review was intended to provide information on the quality of the data in more detail than an EPA Region I Tier I validation, but was not intended to provide as much detail as an EPA Region I Tier II validation. This data review included an evaluation of the following QC parameters:

- Data Completeness
- Sample Preservation and Technical Holding Times
- Blank Analysis
- Field Duplicates
- Laboratory Control Spikes
- Surrogate Compounds (spiked before sampling)
- Internal and Recovery Standards (spiked before extraction)
- Initial Calibration
- Continuing Calibration

In developing the data review/validation program, the QC checklist review was chosen to monitor technical quality while providing a cost-effective project approach that could be implemented on a faster schedule than a complete Tier II validation. The data review process was used in conjunction with the government independent QA check, detailed below, of duplicate samples to expedite assessment of data quality. While schedule was not of primary importance for this preliminary sampling program, the intent was to develop procedures that could be implemented on an expedited schedule during remediation, if required.

To ensure that the checklist review was effective at identifying QC exceedences, approximately 10% of the data (three data packages) were selected for a more comprehensive EPA Region I Tier II validation. Selection of the samples for Tier II validation was left to the discretion of the reviewer and was intended to be flexible and biased towards the earlier portion of the program. The earlier data packages (samples collected Summer 1999) were selected because these were samples analyzed for both congeners and homologue groups and were also expected to have the highest concentrations of PCBs. With a more detailed validation performed early in the program, significant problems with the laboratory, especially systematic problems, would be identified and corrected quickly. If the results of the checklist review identified potentially significant QC exceedences, a Tier II validation would be implemented to further evaluate the affect of the problem. Similarly, if the Tier II validation identified systematic problems with the laboratory, additional review and or validation might be necessary to assess the effect on the entire data set. Air chemistry data collected on 10 June, 28 July, and 21 August 1999 were selected for Tier II validation.

A Tier II validation includes a review of the QC parameters listed above and also includes an evaluation of the following:

- Overall Evaluation of Data and Potential Usability Issues
- Sample Quantitation
- Target Compound Identification
- System Performance

The summary level findings of the QC data review and validation process and the effects on reported data are discussed below. The validation memoranda are included in Appendix K.

2.5.1. Summer 1999 (June through August) Sampling Quarter

Sample collection media was identified as a significant source of contamination for air samples collected beginning 10 July through the end of November 1999. The source of contamination was determined by the laboratory to be a compound used as a flame retardant on the PUF material used in sample collection. The flame retardant compound created several interferences that prevented detection of the labeled congener #169 internal standard and interfered with the peaks for congener #170. For samples where the congener #169 internal standard was not detected, the laboratory chose labeled congener #138 to calculate total hexa-CB homologues. These data are considered to be acceptable. Results for congener #169 could not be calculated due to the media interference, and the laboratory reported this congener as "I" (Interference) with no associated value. These data should be considered unusable: the presence or absence of the compound could not be determined for these samples.

The interference discussed above also contributed low levels of contamination to the field and laboratory blanks. Individual congener and homologue groups with results less than five times the highest concentration detected in the blanks were reported as non-detect (U) during data review. These results were treated as non-detected values (i.e., half the reported value was used) in summary calculations for averaging seasonal and annual concentrations (see below). Note that all positive field blank results were attributed to contamination. It should also be noted these field blanks were not qualified due to field contamination.

The interference with congener #170 caused detected concentrations in blanks (false positives) as discussed above and also prevented detection of the 10 ng spike in the Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD). The laboratory subtracted the concentration detected in the blanks from the LCS/LCSD and reported percent recoveries for congener #170 as zero. The presence or absence of this compound could not be determined. Results for congener #170 that were less than five times the concentration found in the blanks were rejected (R) as unusable. These results are excluded from the data set.

Samples collected on 6 July, 10 July, and 22 July 1999 were analyzed outside of the designated holding time of 28 days (51, 55, and 47 days, respectively). It appears that the laboratory postponed extracting the samples when they discovered the interference issues discussed above. Once the source of contamination was identified as the sample media, extractions were continued. Samples collected on 9 August and 15 August 1999 were extracted outside of the 14-day holding time (37 and 31 days, respectively). Samples from eight sampling events from the summer of 1999 were received at the laboratory with cooler temperatures above the $2^{\circ}\text{C} \pm 2^{\circ}\text{C}$ requirement. Most of these were at or slightly below ambient temperatures (20-25 $^{\circ}\text{C}$). Both the holding time and the elevated temperature could potentially cause the loss of target analytes from the PUF, causing sample results to be biased low, especially from the mono and di chlorinated species. The majority of the field surrogate (spiked before sampling) recoveries from these samples were acceptable, indicating that little or no target analyte loss occurred. No validation action was taken for holding times or cooler temperature exceedences.

Other minor QC exceedences were identified during the data review, potentially affecting individual analyte results. These included spike recoveries and continuing calibration percent differences, which

were outside of QC limits. These QC excursions were isolated and generally not applicable to the data set as a whole. With the qualifications discussed above, the data are usable as reported for project objectives.

2.5.2. *Fall 1999 (September through October) Sampling Quarter*

The media contamination issue discussed above affected data generated during the fall quarter. Because the Fall 1999 samples were analyzed for total homologue groups only rather than individual congeners, the contamination effects on reported data were minimized (i.e., individual results did not require rejection). Individual homologue group results less than five times the highest concentration detected in the blanks were reported non-detect (U). These were treated as non-detect values (i.e., half the reported value was used) in summary calculations for averaging seasonal and annual concentrations (see below). Note that all positive field blank results were attributed to contamination. For clarification, these field blanks were not qualified as non-detected (U).

2.5.3. *Winter 1999/2000 (November through March) Sampling Quarter*

Internal Standard (IS) recoveries below 10% resulted in the rejection of a small number of sample results from the December and January sampling events. There were several other IS recoveries that exhibited low results (>10%) causing the over-estimation of sample results. No action was warranted for the low IS (>10%) recoveries.

The air samples were extracted and analyzed within the specified holding time; however, cooler temperatures were elevated at the time of receipt by the laboratory. One cooler temperature was as high as 8°C. This exceedence may or may not have been the cause for low IS recoveries discussed above.

The interferent with congener #169 was found again in the internal standard for the method blank sample. The other hexa-CB results for the method blank were calculated using congener #138.

The interferent with congener #170 in the LCS/LCSD analyses was resolved, but there were some slight exceedences for congeners #114, #126, and #189. These exceedences caused the over-estimation of data for those congeners. None of the exceedences have a significant impact on the reported data.

During this quarter, the blank contamination was similar to the previous quarters. All results from the 17 January 2000 event were detected greater than the action limit and were not affected. However, some positive results, from December 1999 and January 2000, were qualified as non-detect (U) due to the contamination found in the method and field blanks.

2.5.4. *Spring 2000 (April through May) Sampling Quarter*

During this quarter, low recovery of some Internal Standards occurred, possibly due to elevated temperatures in a number of sample coolers received at the laboratory. Each of the samples in this quarter were received in coolers with elevated temperatures, ranging from 4°C to 8°C. The IS deviations did cause the rejection of some data and the over estimation of others. Overall, the impact on the data is not very significant. The samples were extracted and analyzed within specified holding times. The data are acceptable for project use.

There were some slight exceedences in LCS/LCSD recovery for congener #189 in April and May, which caused the results for this congener to be biased high. The data are not significantly affected. No action was taken.

Blank contamination from the flame retardant was observed this quarter, which caused some positive results to be qualified as non-detect. Overall, these actions did not have a significant impact on the data.

2.5.5. *Government Quality Assurance (QA) Air Samples*

As a measure of Quality Assurance, QA split samples were collected at duplicate air station 24D during alternating sampling rounds. The QA samples were sent to Phillip Analytical Services, designated QA laboratory by the USACE, for independent analysis. These samples were analyzed for NOAA congeners using the same method as the primary lab, EPA Method 3540C/8082. Comparison results were discussed in chemical quality assurance reports prepared by ENSR and included in Appendix L. The findings are briefly summarized below.

Primary and QA sample results were compared and summarized in two ways: Overall Agreement and Quantitative Agreement, described as follows:

- Overall Agreement represents the number and percentage agreement of all determinations including non-detects reported by either laboratory; and
- Quantitative Agreement represents the number and percent agreement of those determinations where an analyte was analyzed by both laboratories and detected by at least one laboratory.

Agreement is defined as follows:

- Both results are non-detect; or
- Results are non-detect in one sample with a reporting limit greater than the detected value of the other; or
- Two detected concentrations that are within a factor of 4 of each other.

Data discrepancies were categorized into minor or major. Minor discrepancies were defined as those that exceed the agreement criteria and the results are within a factor of 5 of each other. Major discrepancies were those that differ by more than a factor of 5.

Over the summer months, eight QA samples were collected and analyzed. QA results from samples collected on 28 June 1999 differed significantly from the primary lab results and subsequent investigation indicated that primary lab samples were mislabeled in the field or laboratory. The source of the discrepancy could not be resolved and the data for this date was rejected (R) as unusable. The corresponding primary lab sample from 27 August 1999 was broken during analysis and could not be reported: the QA lab results for this date were consistent with those reported for this location during other sampling events.

In general, QA results for the other six sample comparisons agreed well. Overall agreement percentages ranged from 79% to 96% and Quantitative Agreement percentages ranged from 75% to 95%, with the exception of the data for the 28 June 1999 sampling event. For each sampling event, the results for total PCBs met the agreement criteria of a factor of 4. With the exception of the first sampling event (4 June 1999), the QA lab reported consistently higher total PCB concentrations than the primary lab. Some individual results did not meet comparison criteria and are discussed below.

The most common disagreement between the QA results and the associated sample results occurred with congener #169. This congener was not reported (flagged I) by the primary laboratory during the weeks of 10, 16, 22, and 28 July and 3, 9, 15, 21, and 27 August due to interference from sample media contamination (see data validation summary). This congener was reported non-detect by both laboratories in both June 1999 sampling events (before the contamination problem) and as non-detect by the QA lab during the remaining summer sampling events.

Comparison results for congener #114 were flagged as major discrepancies for five events, with the primary lab results consistently higher than the QA lab. Congener #126 was noted to have major disagreements on four occasions, three of which were for positive results reported by the QA lab and non-detect results by the primary lab. The fourth occasion, 15 August 1999, was a QA result consistent with other events and a very high EMPC reported by the primary lab. Comparisons for congener #167 were

considered major discrepancies in five events, with the QA results consistently being higher than the associated samples. Note that the QA lab reports results for congener #167 as the sum of coeluting congeners #167 and #128. Other anomalous results included a non-detect for mono-CB reported by the primary lab for the 22 July 1999 sampling event that did not agree with the reported result from the QA lab or with data from other sampling events. Results for tri-CB were considered a major discrepancy for the 15 August 1999 sampling event, with the QA lab result being the greater of the two samples.

QA samples were collected during alternate sampling rounds for the remainder of the Baseline Program, for an additional six QA lab comparisons. As noted above, the total PCB concentrations met the factor of 4 agreement criteria for each event and the QA laboratory was the higher of the two results. These comparisons had some individual major discrepancies, including octa-CB in two events, tri-CB in one event, and mono-CB in another event. Minor discrepancies included hepta-CB and octa-CB in one event and nona-CB in another. Discrepancies for the heavier homologue groups (hepta, octa, and nona) were the result of the primary lab data being greater than the associated QA samples. Conversely, the discrepancies for the lighter homologue groups (mono and tri) are associated with QA lab results that are higher than the primary samples.

2.5.6. *Field Spike Recoveries*

Field spikes were performed on three occasions: 16 July 1999, 8 October 1999, and 7 April 2000. The laboratory spiked felt pads with 10 ng of each of the target congeners, except deca-CB which was spiked at 20 ng. These pads were placed before the filters in the field sample apparatus so that air was drawn through the pad and on to the sample media as a measure of sample collection efficiency. Spiked samples were collected at duplicate (D) samplers at the same time as a corresponding unspiked sample. The first two spikes were collected from station 24D. However, the ambient concentrations at this location were significantly higher than the spike level resulting in poor spike recoveries (see below). The last spike was collected from station 22D, where the ambient (native) concentrations were much lower. Detailed results are included with the data validation memoranda included in Appendix K.

In summary, spike recoveries from the first two rounds (collected from location 24D) were poor due to elevated concentrations of target analyte in the air and in the native sample used for correction. The poor recovery does not appear to be associated with poor collection efficiency and does not appear to represent significant problems with reported results other than those discussed above.

For the first spike round, 17 July 1999, five congeners had recovery with $\pm 50\%$ of the expected value. These tended to be associated with relatively low or non-detect native sample concentrations. Two congeners (#77 and #123) demonstrated low recovery (21% and 39%) and had concentrations greater than the spike level in the native sample. Six compounds associated with relatively high concentrations in the native sample were calculated as having negative recovery because the native result was higher than the spiked result. Congener #170 was not detected in the spiked sample apparently due to the same interference preventing detection of congener #169 and causing poor LCS recovery for congener #170 as discussed above. These results confirm that congeners #169 and #170 data are not usable for samples associated with contamination, as previously noted above.

During the second spike round, 8 October 1999, four homologues had recoveries that met criteria. As with the July spike sample, the acceptable recoveries tended to occur on samples with low or non-detect results. Homologues tetra-CB and penta-CB did have good recovery with high sample concentrations. There were a few congeners in the LCS and LCSD that exhibited high recovery. Congener #114 had recoveries of 975% and 1,230% in the LCS and LCSD, respectively, and congener #118 had recoveries of 770% and 1,200% in the LCS and LCSD, respectively. Although congener #170 does have acceptable recovery (111%) in the LCS, it has low recovery (31%) in the LCSD. These recoveries demonstrate that congener #170 is not usable due to the contamination discussed above.

The third spiked sample was collected on 17 April 2000 from station 22D, where native concentrations were significantly lower than at station 24D. Recoveries from this sample were much improved over those from 24D. Twelve of 14 congeners had recoveries within $\pm 50\%$ the expected value. One congener, #180 had a slightly elevated recovery, 171%, indicating a slight high bias, but not a significant concern. Recovery for congener #170 was 597% indicating potential systematic difficulties with the quantitation of this congener (see above). QC exceedences associated with the quantitation of this single congener are not likely to significantly affect reported data.

2.5.7. Data QA/QC Summary

The QA lab comparisons indicated general overall agreement. Total PCB concentrations reported by the two labs were within a factor of four, meeting agreement acceptance criteria. It is noteworthy to mention, with a single exception, the total PCB concentrations reported by the QA lab were consistently greater than those reported by the primary lab. For the most part, results for individual analytes also met agreement criteria with a few exceptions as discussed above. For samples analyzed during the summer for the 14 WHO congeners, the majority of analytes met criteria with comparisons for only two to four (including congener #169) congeners noted as discrepancies. Investigation of these discrepancies did not indicate systematic laboratory or analytical methodology problems other than already noted due to contamination of the sample media. Similarly, results from the remainder of the Baseline Program were in agreement with some apparently isolated discrepancies for individual homologue group results. The reason for these discrepancies appears to be consistent with the QA lab reporting higher concentrations than the primary lab or differences in the two laboratories' identification and reporting of the higher weight homologue groups. Because comparisons for the majority of congeners, homologue groups, and total PCB results were in agreement, no additional investigation is warranted.

3.0 METEOROLOGICAL DATA

The meteorological data are presented in two formatted reports: a windrose and an hourly summary. The data reports can be found in Appendix G. Electronic versions of the data are contained in a Microsoft Office Excel[®] spreadsheet. The hourly summary presents the hourly values for each parameter measured as well as the average maximum and minimum values for all parameters except wind direction. The statistical values are not presented for the wind direction since they would have no useful purpose. The wind direction is better depicted in the windrose.

The windrose provides a graphical depiction of the wind speed and wind direction as it varied over the sampling period. It includes a graphic of the prevailing winds and a table providing the percentage of occurrence of each wind speed class. An illustrated example of how to read the windrose is included in Attachment 1.

4.0 SUMMARY

This report is designed to provide background information on the structure and content of the annual report. Data is contained in the appendices to this report. Specifically, Appendices B-F contain summary data regarding air sample results, and Appendix G contains meteorological data.

FIGURES

Figure 1: Site Diagram – Upper Harbor

Figure 2: Site Diagram – Lower Harbor

Figure 1: Site Diagram – Upper Harbor

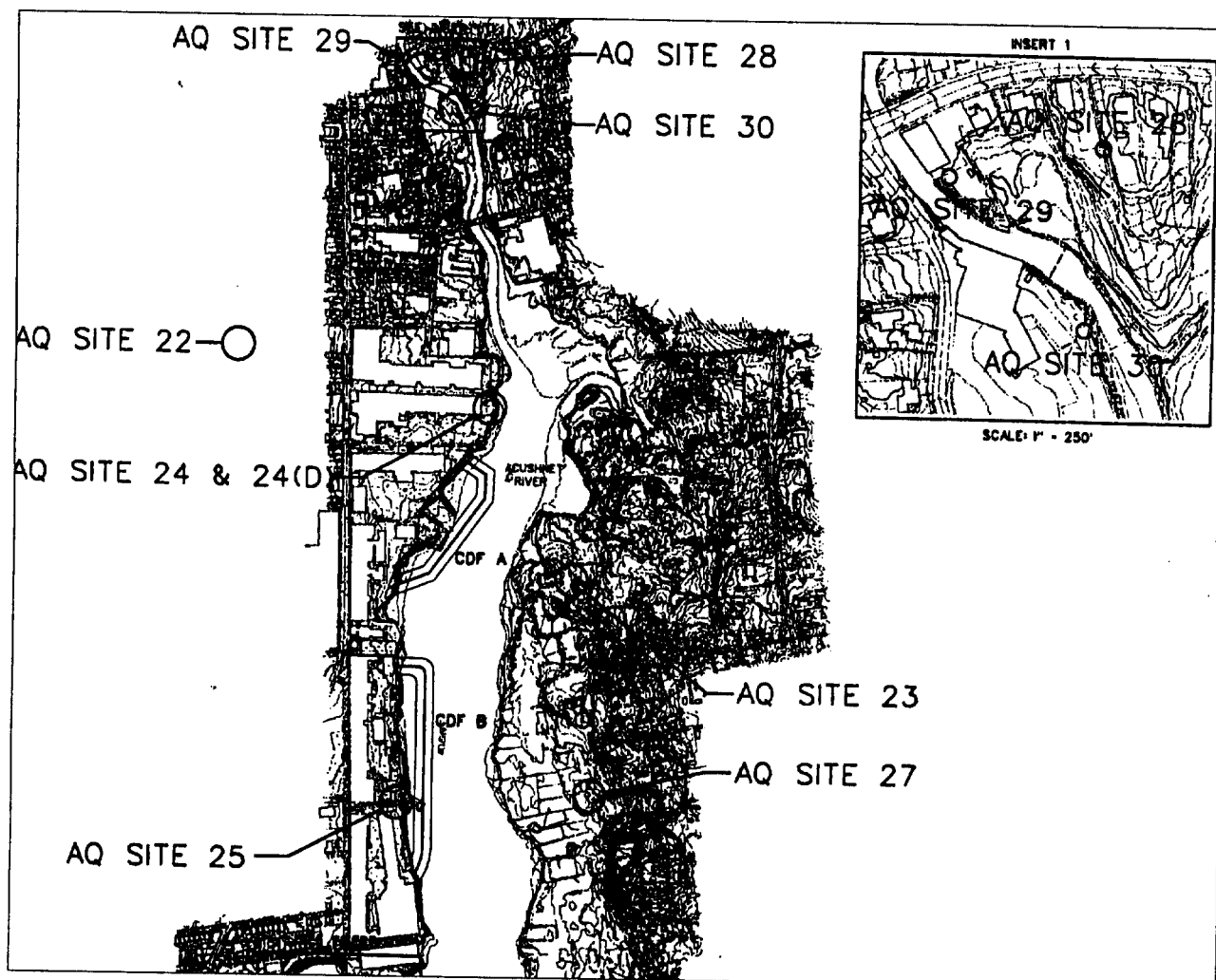
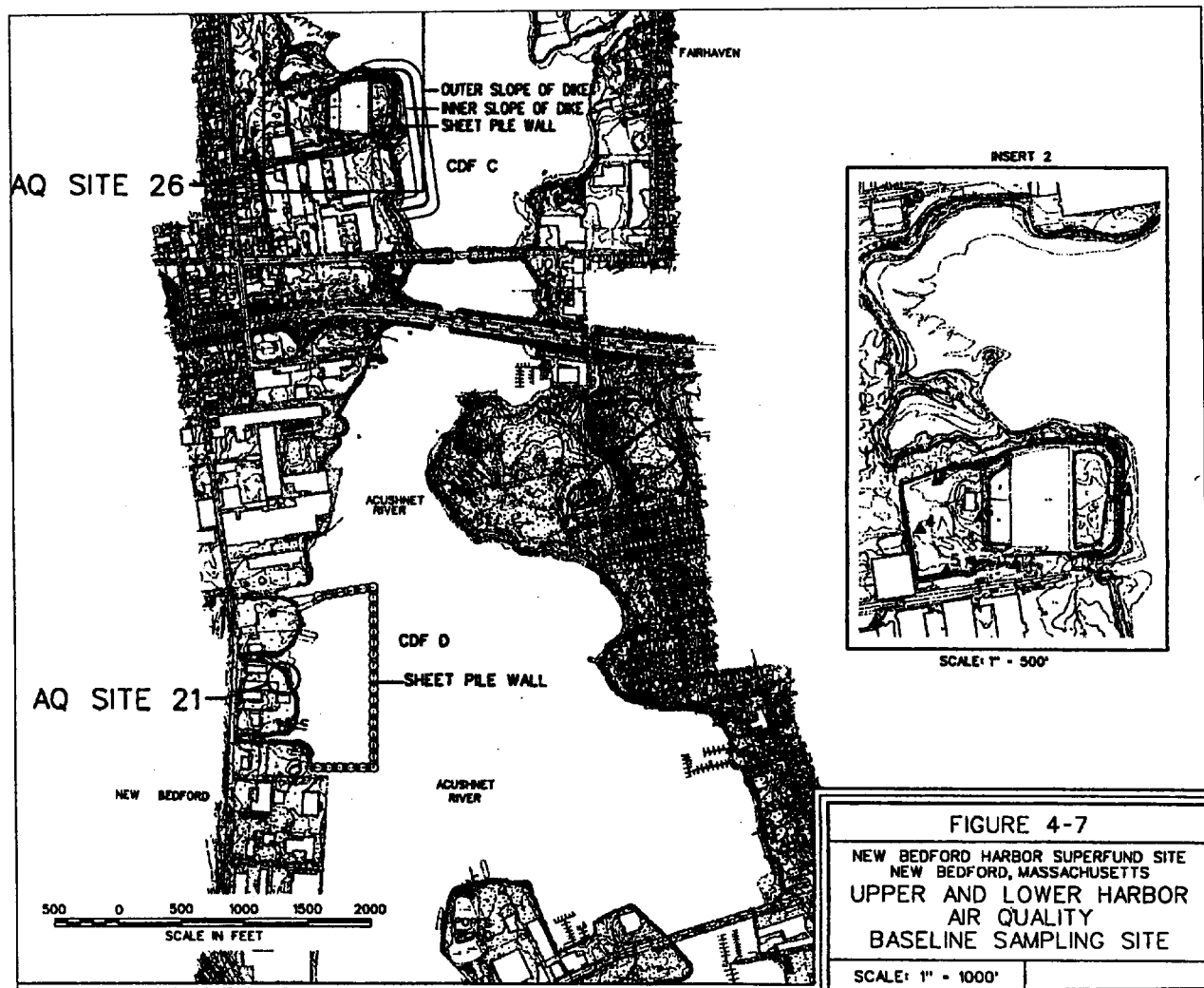


Figure 2: Site Diagram – Lower Harbor



ATTACHMENTS

Attachment 1 – Windrose Graphic Example

Attachment 2 – Windrose Graphic

Attachment 1

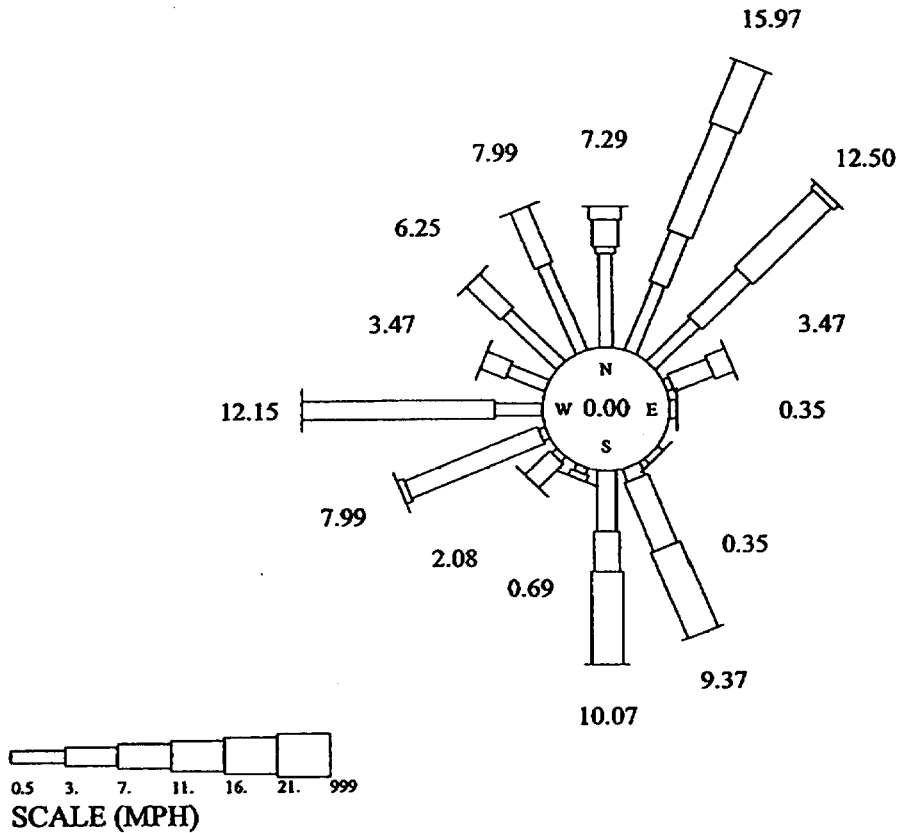
Windrose Graphic Example

The graphic in Attachment 2 provides an example of a windrose developed for this project. The 0.00 in the center of the windrose indicates the percent of calm winds measured during the report period. In this example, there were 0.00% calm winds during the period. Each of the "petals" of the windrose indicates the total percent of time the wind was blowing from the indicated direction as well as the percent of each "wind speed class." Using the prevailing NNE petal of the windrose as an example, the graphic provides the following information:

15.97% of the total winds were from the NNE
3.82% were 0.5 to 3 mph winds from the NNE
2.78% were 3 to 7 mph winds from the NNE
5.90% were 7 to 11 mph winds from the NNE
3.47 % were 11 to 16 mph winds from the NNE
0.0% were 16 to 21 mph winds from the NNE
None of the NNE winds were > 21 mph

Attachment 2

Windrose Graphic



WIND SPEED (MPH) PERCENT OCCURRENCE							WIND SPEED (MPH) PERCENT OCCURRENCE						
	0.5-3.	3.-7.	7.-11.	11.-16.	16.-21.	>21.		0.5-3.	3.-7.	7.-11.	11.-16.	16.-21.	>21.
N	4.86	0.35	1.39	0.69	0.00	0.00	S	0.00	3.13	2.08	4.86	0.00	0.00
NNE	3.82	2.78	5.90	3.47	0.00	0.00	SSW	0.35	0.35	0.00	0.00	0.00	0.00
NE	3.13	3.47	5.56	0.35	0.00	0.00	SW	0.35	1.74	0.00	0.00	0.00	0.00
ENE	0.35	2.08	1.04	0.00	0.00	0.00	WSW	0.35	7.29	0.35	0.00	0.00	0.00
E	0.00	0.35	0.00	0.00	0.00	0.00	W	2.43	9.72	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00	WNW	2.08	1.39	0.00	0.00	0.00	0.00
SE	0.00	0.35	0.00	0.00	0.00	0.00	NW	3.82	2.43	0.00	0.00	0.00	0.00
SSE	0.00	0.69	3.82	4.86	0.00	0.00	NNW	4.86	3.13	0.00	0.00	0.00	0.00